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First flight for H-1 turned exhaust

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NAVAIR PATUXENT RIVER, MD – A major survivability upgrade to the AH-1Z/UH-1Y aircraft, currently in the latter stages of developmental flight test here, made its first flights this week at the Bell Helicopter XworX facility in Texas.

The upgrade, consisting of an integrated engine exhaust management system that then turns the hot exhaust gases out and away from the aircraft's tail boom, quickly followed Monday's ground run accomplishment by expanding the flight envelope from hover to 120 knots Tuesday.

"The flight consisted of a six-minute hover," explained Marine Lt. Colonel David J. Anderson, the H-1 program's assistant program manager for Systems Engineering, "followed by an over-night teardown and inspection. Tuesday, after the Bell team put everything back together, we took it up to 120 knots."

Bell's Advance Programs unit has been exploring ways to improve survivability of the Cobra for several years, developing a solution by managing the exhaust flow and integrating off-the-shelf components, then turning the exhaust away from the helicopter's tail boom.

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“This is the culmination of over a year of design integration effort by a team of dedicated professionals,” said Tom Mast, a Bell design engineer on the program. “Not only will it further decrease the helicopter’s infrared signature, but engineers expect it will help with decreasing engine exhaust heat on AH-1Z and UH-1Y tail booms and reducing engine compartment temperatures. The upgraded T-700 engines require more advanced engine exhaust management than the older, less powerful ones. Finally, the system permits the engine to perform more efficiently, burning less fuel for the same amount of power.”

The upgrade, which will also be applied to currently fielded AH-1W Super Cobras, many of which are supporting Marine Corps operations in Iraq, Afghanistan and the Horn of Africa, is the first major engineering prototype effort for Bell’s XworX to benefit the H-1 program. Flight testing of the turned exhaust modification on the AH-1W Super Cobra is scheduled to begin in October with fielding in March 2005.

“Performance of the new turned exhaust over the past two days confirms what we hoped we would see,” Anderson said. “Bell Advanced Programs and XworX are living up to our expectations – they’re cutting their teeth on the AH-1Z and so far, we like what we see.”

As originally configured, exhaust gases flowing over the tail boom made for a larger IR signature in both the AH-1W and the upgraded AH-1Z and UH-1Y. Because of greater heat coming out of the up-rated engines in the AH-1Z and UH-1Y, the exhaust heat also started affecting the structure of the tail boom itself. Advanced non-destructive inspection technology enabled NAVAIR engineers to understand the problems caused by the heating before they became safety of flight issues.

“We developed this innovative modification to save lives and reduce support costs,” said Kendall Goodman, Bell’s engineering team leader.

XworX engineers, working with their NAVAIR counterparts, fabricated and installed the parts for the turned exhaust modification. Complete flight test envelope expansion flights for both the AH-1Z and UH-1Y will continue at NAS Pax River.

“We were going to do this all along to gain additional survivability,” explained Marine Col. Doug Isleib, H-1 program manager here, “but we found that what works for IR signature reduction also works to lower tail boom temperatures – making turned exhaust the optimal solution to both concerns.”

The H-1 Upgrades Integrated Test Team here currently has achieved approximately 1,800 flight test hours with five

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aircraft (three AH-1Z and two UH-1Y test aircraft, of which all but one AH-1Z are production representative). The test aircraft have flown 222 knots, maneuvered from –0.4 to +3.5 g's, been well above the 10,000-foot altitude mark and recently completed their second operational assessment by Fleet pilots. The report from that assessment is pending.

With the turned exhaust-equipped AH-1Z returned to a flight status, XWorX artisans are now turning their attention to performing the same modification on the 84 percent identical UH-1Y. Flight test on that Y-Model Huey will resume once the modification is completed.

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Photo Cutline

turnedexhaust.jpg – Up and away! The first AH-1Z takes a new turned exhaust installed at Bell Helicopter's XworX facility for its first flight Monday in Texas. The new exhaust turns the hot exhaust gases out and away from the aircraft's tail boom to keep the aircraft's IR signature lower and to reduce annealing of the structure. This six-minute hover was followed by a 120 knot-flight Tuesday.

Photo provided by Bell Helicopter.